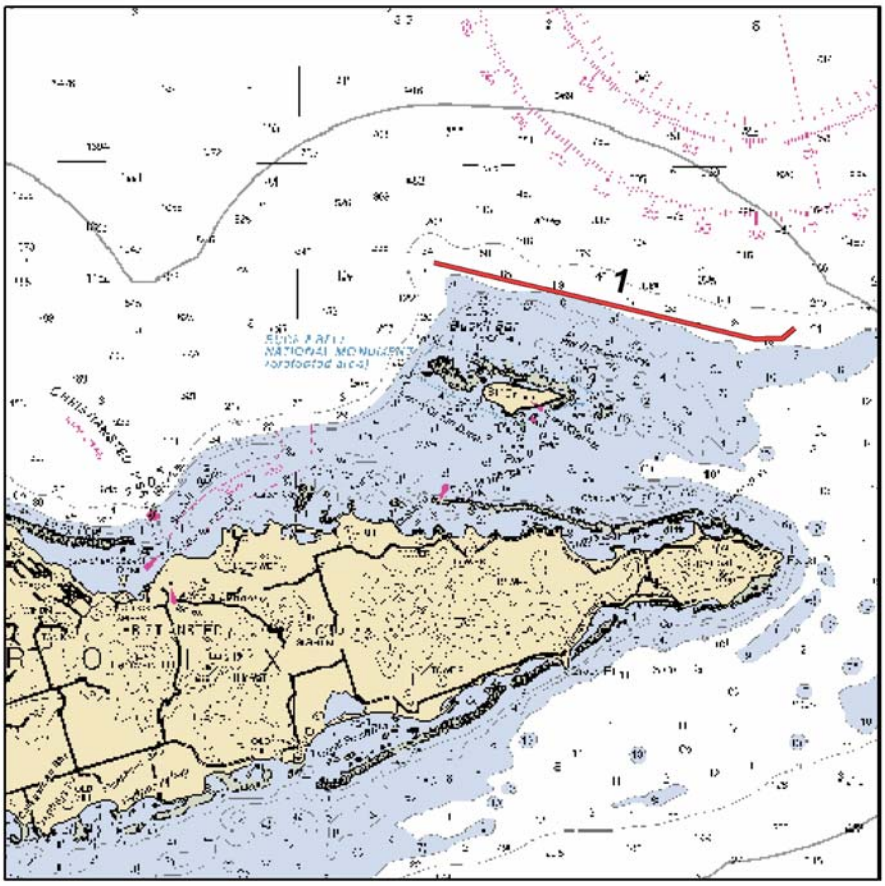
2004 Visual Characterization of Benthic Habitats in the USVI

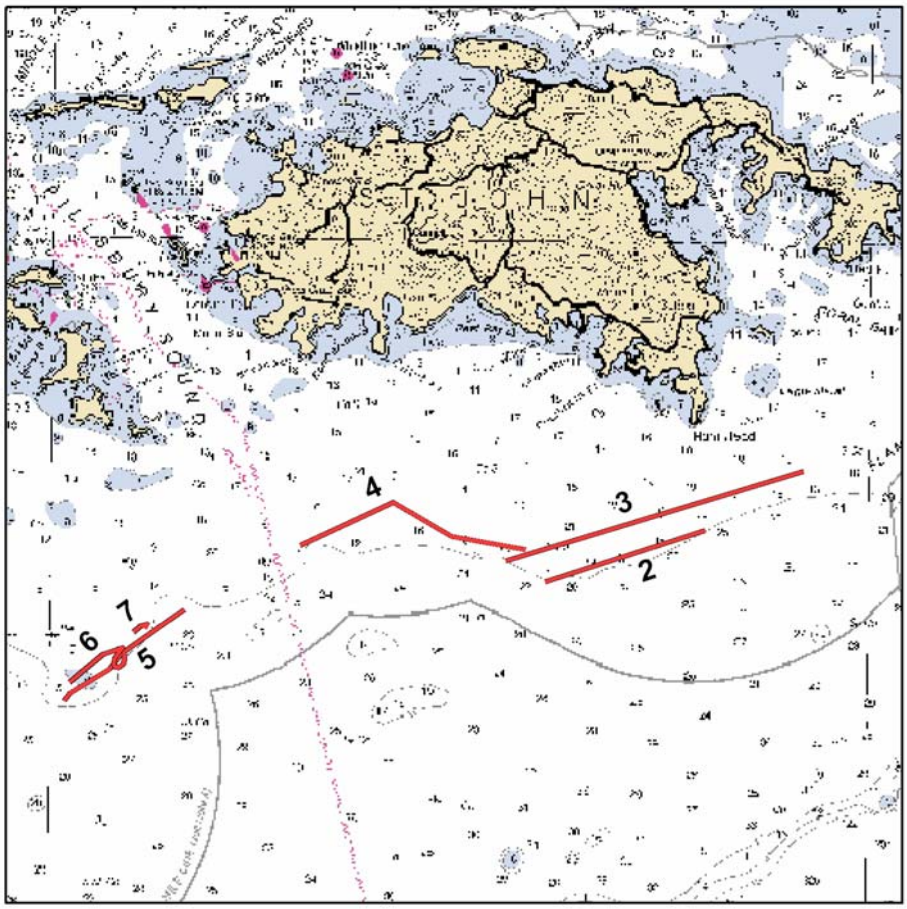
NOAA/NOS/NCCOS/CCMA/Biogeogrpahy

Benthic habitats in moderately deep waters (>30 m and <100 m) around the United States Virgin Islands (USVI) were visually-characterized using an underwater video camera. The data was collected to train and validate an automated benthic habitat characterization technique which uses very fine-scale multibeam data.

Sampling Design

Seven transects were chosen to provide a representative sample of the benthic habitats within moderately deep waters (Figures 1 and 2). Surveyed areas were at most 100 m deep and were relatively level to meet equipment constraints. The transects were placed so that they traversed as many different benthic habitats as possible. Although the precise locations and designations of benthic habitats in the study area were unknown beforehand, habitat distinctions could be made from a compilation of high-resolution multibeam bathymetry data and nautical charts. The bathymetry data was collected during the same 2004 research mission before transects were chosen. The bathymetry data and nautical charts were divided into areas of distinct benthic habitat by depth, roughness and distinct spatial patterns (ridges, bumps, troughs, regular undulations, etc.). Data from all transects were used for both training and validating the habitat characterization technique.





Video Acquisition

The NOAA ship Nancy Foster was used to collect underwater video of benthic habitats from February 22 to March 1, 2004. The seven transects traversed 30.5 km and provided approximately 10 hrs of video. Video was acquired using a downward pointing camera mounted on a towed underwater platform called the MiniBat. The MiniBat provided limited control of depth and was used to position the camera as close to 2 m off the bottom as possible. The camera height off the bottom ranged from 0.5 m to 10 m and averaged approximately 3 m. This range of differences translated into a range of camera field of views from approximately 0.5 m X 0.5 m to 10 m X 10 m with an average of 3 m X 3 m. Ship velocity and correspondingly camera velocity was approximately 1 m/s. All video was taken during daylight hours to guarantee sufficient ambient light levels for visual interpretation.

Video was recorded onto MiniDV tapes as it was acquired. Time, ship velocity, tow cable length, and shipboard GPS coordinates were recorded along with the video. This data was used to estimate the MiniBats geographic position using a layback method. The layback method adjusts the ship's GPS position by the distance of the Minibat's relative

position to the ship which is estimated by the tow cable length. Similar studies using this layback method have estimated positional accuracy is within 50 m (CRED, 2001).

Benthic Habitat Interpretation

The benthic habitat was characterized by visual interpretation of video images by two video interpreters. Video on the MiniDV tapes were displayed on a television using a digital video camera or miniDV cassette recorder. A transparent sheet demarcated with a 10 X 10 grid was fitted to the television screen to facilitate percent cover estimates. The video was paused every 10 seconds and the image was interpreted for three components of benthic habitat: structure, substrate and biological cover.

Structure referred to the broad-scale habitat class within the entire field of view. Based on previous benthic habitat work in the area (Kendall et al., 2001) the structure designation was chosen from either 1) colonized pavement, 2) colonized pavement with sand channels, 3) sand, 4) scattered coral and rock in sand, or 5) other (with description).

Substrate described the visible abiotic components of the benthic habitat. The four substrate classes, considered mutually exclusive and exhaustive were 1) consolidated material, 2) sand, 3) rubble (particles ~ 2-10 cm) and 4) cobble (particles < 10 cm). Substrate was measured to the nearest percent of the visible bottom. An estimate of rugosity was approximated by the vertical range of substrate in the field of view and was classified as either high (> 0.3 m) or low (<0.3 m).

Biological cover referred to the biotic component of the seafloor and was divided among five mutually-exclusive categories differentiated by their size and shape. These were 1) sponge (Phylum Porifera), 2) soft coral (Subclass Octocorallia and subclass Ceriantipatharia), 3) hard coral (Subclass Hexacorallia), and 4) fleshy algae and 5) algae veneer. The sum of all cover categories provided an estimate of total colonization. If a biological cover component could not be unquestionably identified as one of the five cover categories it was only added to the total colonization estimate.

Due to variability in camera height, and camera listing and swinging, not all components of the habitat could be recorded consistently. To compensate for potential problems in scale and unknown habitats, each record was differentiated into one of five interpretation classes. The distinct interpretation classes were created based on which components of the habitat were visible. The distance classes (and the corresponding visible habitat components) are: 1) too close or too far (no components), 2) far (only structure), 3) far (only structure and substrate), 4) far (only structure, substrate and large organisms) and 5) appropriate distance (structure, substrate and large and small organisms).

References

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